DOCUMENT RESUME

ED 469 594 CG 031 979

TITLE	Science-Based Substance Abuse Prevention: A Guide. Guide to Science-Based Practices.
INSTITUTION	Substance Abuse and Mental Health Services Administration (DHHS/PHS), Rockville, MD. Center for Substance Abuse Prevention.
REPORT NO	SMA-01-3505; CSAP-1
PUB DATE	2001-00-00
NOTE	25p.; Based on "A Guide to Science-Based Practices in Substance Abuse Prevention" (Paul J. Brounstein, Janine M. Zweig, and Stephen E. Gardner). Produced with Row Sciences Inc.
CONTRACT	282-98-0023
AVAILABLE FROM	For full text: http://modelprograms.samhsa.gov/pubs_science.htm.
PUB TYPE	Guides - Non-Classroom (055)
EDRS PRICE	EDRS Price MF01/PC02 Plus Postage.
DESCRIPTORS	Evaluation Methods; Models; *Outcomes of Treatment; *Prevention; Program Effectiveness; *Program Evaluation; *Program Implementation; Scientific Research; *Substance Abuse

ABSTRACT

The Substance Abuse and Mental Health Services Administration's Center for Substance Abuse Prevention (CSAP) is responsible for identifying and disseminating scientifically defensible knowledge about proven prevention models and principles to the substance abuse prevention field. This booklet is intended to assist prevention practitioners and others involved in the design, implementation, and evaluation of substance abuse prevention programs. This document provides the following: describes the evolution of the conceptual model that CSAP uses to provide a unifying framework for substance abuse prevention; discusses the principles that provide the foundation for understanding and defining research findings as scientifically defensible; and illustrates how CSAP applies specific principles and criteria to research studies, program evaluations, and scholarly efforts to identify scientifically defensible findings, prevention principles, and prevention models. The guide also provides specifics about the CSAP methodology for selecting model programs and identifying scientifically defensible principles. It is one in a series of three products that together assist prevention practitioners, evaluators, state and local program administrators, policymakers, and funders in designing and assessing scientifically defensible programs. (Contains 25 references.) (GCP)

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GUIDE TO SCIENCE-BASED PRACTICES 1

Science-Based Substance Abuse Prevention:

A Guide

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GUIDE TO SCIENCE-BASED PRACTICES 1

Science-Based Substance Abuse Prevention:

A Guide

Substance Abuse and Mental Health Services Administration
Center for Substance Abuse Prevention
Division of Knowledge Development and Evaluation

Acknowledgments

This document was produced under the guidance of Stephen E. Gardner, D.S.W., project officer, Paul J. Brounstein, Ph.D., and Deborah B. Stone, Ph.D., Division of Knowledge Development and Evaluation, Substance Abuse and Mental Health Services Administration, Center for Substance Abuse Prevention (SAMHSA/CSAP), through contract #282-98-0023 to ROW Sciences, Inc., Carol Winner, project director.

Science-Based Substance Abuse Prevention: A Guide is based on *A Guide to Science-Based Practices in Substance Abuse Prevention*, a seminal monograph developed and written by Paul J. Brounstein, Janine M. Zweig, and Stephen E. Gardner, with substantial contributions from Maria Carmona, Paul Florin, Roy Gabriel, and Kathy Stewart.

Special thanks go to a dedicated review panel composed of Eric Einspruch, Roy Gabriel, and Katherine Laws, RMC Research Corporation; Carol Hays, Illinois State Incentive Grant Program; Patricia Post, Central Regional Center for the Application of Prevention Technologies; and Mary Joyce Prudden, CSAP, who offered invaluable suggestions for improving the document.

The Department of Health and Human Services (DHHS) has reviewed and approved policy-related information in this document but has not verified the accuracy of data or analyses presented in the document. The opinions expressed herein are the views of the authors and do not necessarily reflect the official position of SAMHSA or DHHS.

DHHS Publication No. (SMA)01-3505
Printed 2001

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Foreword

Although recent reports show a leveling or decrease in substance use among our nation's youth, drug abuse remains a problem in our country. There were 14.8 million current users of illicit drugs in 1999. This figure represents 6.7 percent of the population 12 years and older. The 1999 National Household Survey also found increases in illicit drug use among adults ages 18–25. Although the rates for those 26-34 years old and 35 years and older have not changed significantly since 1994, overall statistics indicate that there is still work to be done in preventing substance abuse.

The Substance Abuse and Mental Services Health Administration's (SAMHSA) Center for Substance Abuse Prevention (CSAP) developed this series of products in response to the ongoing substance abuse problems. The three components in this series support CSAP's mission to provide resources that are based on science, with measurable outcomes, and designed to help community and state leaders formulate targeted programs.

CSAP is committed to sponsoring, accumulating, and integrating knowledge regarding scientifically defensible and effective prevention practices. The primary foci of each document in this series is CSAP grantees, constituent organizations, and the communities these groups serve.

We are pleased to release this guide to CSAP's conceptual framework and methodology for designing and assessing scientifically defensible programs for substance abuse prevention. The results reflect the findings of 10 years of CSAP-funded demonstration programs, as well as other advances in the design and evaluation of successful prevention strategies. These findings together lay the foundation for a new, empirically based approach to prevention programming.

The booklet highlights the risk and protective factors that help determine an individual's vulnerability to substance abuse. It also examines CSAP's qualitative and quantitative strategies for evaluating existing substance abuse prevention programs and developing scientifically defensible best practices.

This booklet is one in a series of products developed to help key stakeholders structure and assess scientifically defensible programs. It is designed to serve practitioners and others involved in the development, implementation, and evaluation of substance abuse prevention programs as we work together on innovative and effective solutions that respond to the unique needs of our individual communities.

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Science-Based Substance Abuse Prevention:

A Guide

The Substance Abuse and Mental Health Services Administration's Center for Substance Abuse Prevention (CSAP) is responsible for identifying and disseminating scientifically defensible knowledge about proven prevention models and principles to the substance abuse prevention field. Because there is a wide range of opinion about appropriate methodological criteria, standards, and expectations—ranging in rigor from requiring experimental studies to observing systematically to accepting clinical judgments—determining what constitutes that knowledge can be challenging.

Over the past 10 years, CSAP demonstration programs have mirrored the field's growth in understanding what works in substance use prevention. Initially, programs implemented and tested prevention approaches based on practitioner observation. The realization, for example, that most people had little knowledge about the harmful effects of alcohol and illicit drugs led to the development of public information campaigns and school-based curricula designed to replace myths with facts. With increasing sophistication, this knowledge-centered focus enlarged to include innovative interventions based on theories derived from research in related fields (e.g., Bandura's social learning theory). More recently, data have become available from substance abuse prevention-specific program evaluations that provide empirical evidence about those strategies that succeeded in changing knowledge, attitudes, and behavior. Those findings, many of which stem from CSAP-funded demonstration programs, have laid the foundation for a new empirically based approach to prevention programming—one that CSAP is challenging the field to use (Hansen and McNeal, 1996; Pandina, 1998).

This booklet, *Science-Based Substance Abuse Prevention: A Guide,* is intended to assist prevention practitioners and others involved in the design, implementation, and evaluation of substance abuse prevention programs. This document provides the following:

- Describes the evolution of the conceptual model that CSAP uses to provide a unifying framework for substance abuse prevention.
- Discusses the principles that provide the foundation for understanding and defining research findings as scientifically defensible.
- Illustrates how CSAP applies specific principles and criteria to research studies, program evaluations, and scholarly efforts to identify scientifically defensible findings, prevention principles, and prevention models.

The *Guide* also provides specifics about the CSAP methodology for selecting model programs and identifying scientifically defensible principles. It is one in a series of three products that together assist prevention practitioners, evaluators, state and local program administrators, policymakers, and funders in designing and assessing scientifically defensible programs. The other two products are:

- *Promising and Proven Substance Abuse Prevention Programs,* a comprehensive compilation of both proven and promising interventions in an easy-to-scan grid organized by risk factor and domain; and
- *Principles of Substance Abuse Prevention,* a narrative and selected listing of proven and cited interventions organized by domain.

State and federal agencies, local governments, and private foundations have become increasingly interested in funding substance use prevention

programs with measurable outcomes. The new emphasis on performance means that prospective funding applicants must demonstrate that the programs they propose are both outcome-oriented and likely to achieve the outcomes predicted. Using scientifically defensible interventions can help prevention practitioners respond to demands for accountability and improve their capacity to provide effective services.

CSAP's demonstration programs have been the testing ground for many of the most promising ideas for intervening with those at high risk for substance use. As a part of its knowledge development and application role, CSAP has accepted the responsibility for assessing those interventions and disseminating results to the field for replication and adaptation. In 1999, CSAP issued a primer on effective programs titled *Understanding Substance Abuse Prevention, Toward the 21st Century: A Primer on Effective Programs* that described eight model programs and briefly summarized the methodology guiding their selection. Given the increased emphasis on incorporating scientifically defensible principles and interventions in both new and existing programs, it is important that prevention practitioners understand the conceptual framework and criteria used in rating prevention interventions and attesting to their effectiveness.

The CSAP Conceptual Framework: Risk and Protective Factors

Theory and theoretical frameworks in the substance use prevention field have been evolving over time, often through induction based on applied empirical research. Among the most important developments in substance abuse prevention theory and programming in recent years has been a focus on risk/protective factors as a unifying descriptive and predictive framework.

Risk Factors

Put simply, one often tested and supported hypothesis derived from this framework is that the more risk factors a child or youth experiences, the more likely it is that she or he will experience substance use and related problems in adolescence or young adulthood (Bry & Krinsley, 1990; Newcomb & Felix-Ortiz, 1992). Risk factors include biological, psychological/behavioral, and social/environmental characteristics such as a family history of substance use, depression or antisocial personality disorder, or residence in neighborhoods where substance use is tolerated. Researchers have also found that the more the risks in a child's life can be reduced—for example, by effectively treating mental health disorders, improving parents' family-management skills, and stepping up enforcement of laws related to the sales of illicit drugs to minors or to drinking and driving—the less vulnerable that child will be to subsequent health and social problems (Hawkins, Catalono, & Miller, 1992).

Protective Factors and Resilience

Protective factors, such as solid family bonds and the capacity to succeed in school, help safeguard youth from substance use. Research has also demonstrated that exposure to even a substantial number of risk factors in a child's life does not necessarily mean that substance use or other problem behaviors will inevitably follow. Many children and youth growing up in presumably high-risk families and environments emerge relatively problem-free. The reason for this, according to many researchers, is the presence of protective factors that reduce the likelihood that a substance use disorder will develop (Hawkins et al., 1992; Mrazek & Haggerty, 1994). The research on protective factors explores the positive characteristics and circumstances in a person's life and seeks opportunities to strengthen and sustain them as a preventive device. Among these resilient children, protective factors appear to balance and buffer the negative impact of existing risk factors (Anthony & Cohler, 1987; Hawkins et al., 1992; Mrazek & Haggerty, 1994; Wolin & Wolin, 1995). From a substance abuse prevention perspective, protective factors function as mediating variables that can be targeted to prevent, postpone, or reduce the impact of use.

Taken together, the concepts of risk and resilience enhance understanding of how and why youth initiate or refrain from substance use. Although not all risk and protective factors are

amenable to change—genetic susceptibility to substance use, for example—research demonstrates that their influence can often be assuaged or enhanced.

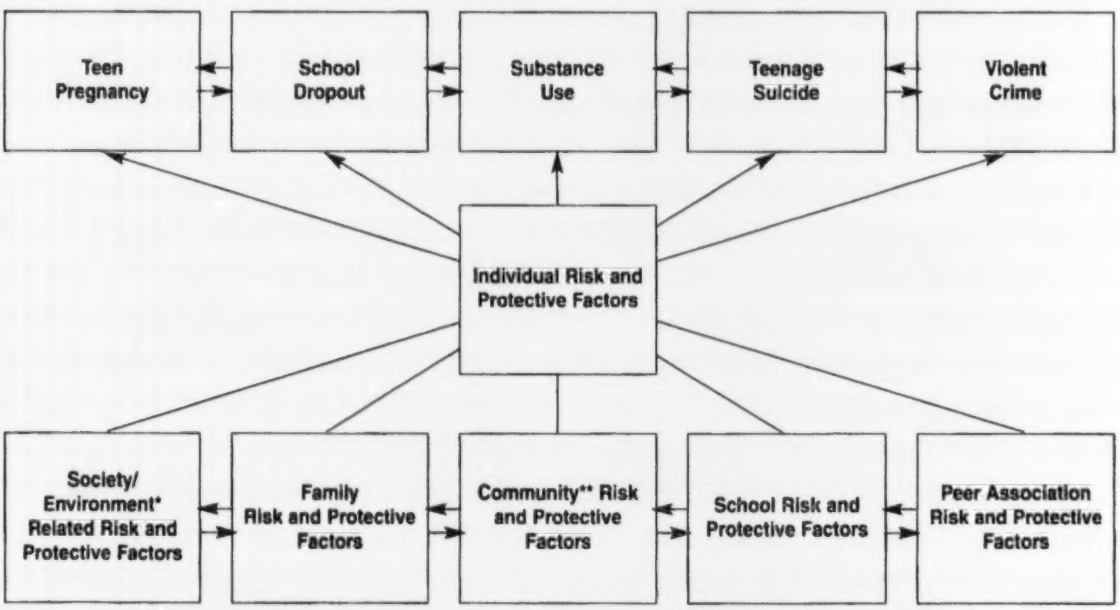
Domains

Risk and protective factors exist at every level at which an individual interacts with others and the society around him or her. Clearly, the individual brings a set of qualities or characteristics to each interaction, and these factors act as a filter, coloring the nature and tone of these interactions—whether positive or negative. One useful way to look at this interplay is to organize interactions by the six life or activity domains in which they chiefly occur. Based on more than 30 years of study, researchers have delineated specific subcategories of risk within each domain. They include the following:

Domain	Subcategory of Risk
■ Individual	biological and psychological dispositions, attitudes, values, knowledge, skills, problem behaviors
■ Peer	norms, activities, bonding
■ Family	function, management, bonding
■ School/work	bonding, climate, policy, performance
■ Community	bonding, norms, resources, awareness/mobilization
■ Society/ environmental	norms, policy/sanctions

Research has also revealed that domains are not static in their impact, but interact with each other and change over time. As an individual develops, his or her perceptions and interactions with family, peers, schools, work, and community alter (Botvin et al., 1995; Donaldson, Graham, & Hansen, 1994; Hawkins et al., 1992; Kumpfer, Molgaard, & Spoth, 1996). CSAP graphically depicts this more intricate set of relationships through its Web of

Figure 1
Web of Influence



*Society/Environment: Refers to the total complex of external social, cultural, and economic conditions affecting a community or an individual.

**Community: Refers to the specific geographic location where an individual resides and to the conditions within that particular area.

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Institute of Medicine Prevention Categories

Universal programs (e.g., mass media, school-based health curricula): Target the general population.

Selective programs (e.g., mentoring programs aimed at children with school performance or behavioral problems): Target those at higher-than-average risk for substance abuse.

Indicated programs (e.g., parenting programs for parents with substance abuse problems): Target those already using or engaged in other high-risk behaviors (such as delinquency) to prevent chronic use.

Influence model (figure 1). The Web model illustrates the complex series of interactions that occurs between the individual and the six external domains that can result in substance use and other problem behaviors.

Institute of Medicine Prevention Classifications

Just as the Web of Influence can be used to illustrate relationships among risk and protective factors across domains, the Institute of Medicine's (IOM) prevention program classification system is useful in understanding the differing objectives of various interventions and matching them to the needs of a targeted population (Kumpfer et al., 1997).

The IOM system classifies prevention interventions according to the population they affect (Gordon, 1987). Universal interventions target general population groups without reference to those at particular risk. All members of a community benefit from a universal prevention effort, not just specific individuals or groups within a community. Selective interventions target those who are at greater-than-average risk for substance use. Targeted individuals are identified on the basis of the nature and number of risk factors for substance use to which they may be exposed. Indicated interventions are aimed at individuals who may already display signs of substance use or abuse and are designed to prevent the onset of regular or heavy substance use. Together, the Web of Influence and the IOM classification system provide a conceptual and organizational scheme for identifying risk groups and targeting outcomes.

Issues in Defining Scientifically Defensible Knowledge

Scientific inquiry stems from the need to understand the world at large. The strength of science and the scientific method is that it makes use of strictly defined, standardized procedures to determine how events are causally related. As science improves its methods, levels of certainty about the nature and extent of cause-and-effect relationships increase and more is understood about the resources and effort required to achieve specific changes in existing relationships. Using the scientific method more systematically to identify knowledge also fosters recognition of the diversity of approaches involved in implementing prevention programs and extracting data.

Different Ways of Knowing

A key CSAP objective is to ensure that the interventions it recommends to the field are outgrowths of rigorous evaluation and are described in credible terms, comprehensible to the multiple target audiences involved in substance abuse prevention. Emerging out of the cultural, geographic, and strategic diversity of high-risk population programming is a recognition of the different ways in which people know or understand that a program is having an impact on youth, families, and communities.

Like good medicine, the practice of prevention is both an art and a science. In assessing prevention programs as a whole and attempting to understand whether the strategies and interventions used are exerting an impact and how they affect human behavior, it is critical to consider both quantitative and qualitative evidence. Quantitative data supply the raw material for the extensive statistical analyses that lend scientific credence to program results. Qualitative data provide the rich, descriptive information needed to explain the effects of program interventions.

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Data Types and Research Strategies

Although much discussion of knowledge focuses on the results of quantitative outcome evaluations, qualitative information can also be extremely useful even if it is not always amenable to strict outcome evaluation. Qualitative data may describe program process or identify contextual mediating variables that affect outcome results. Such process information embellishes findings from programs, providing an enhanced understanding of program results. When researchers and the field, in general, ignore qualitative data, valuable information can be lost.

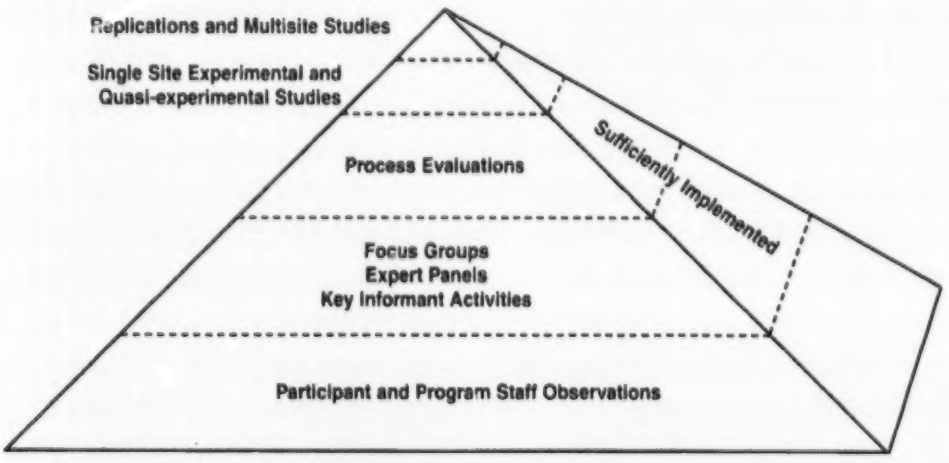
Reviews of qualitative information can produce credible findings and recommendations. For example, expert consensus panels convened by many government agencies (e.g., Center for Substance Abuse Treatment, Food and Drug Administration, National Institute on Alcohol Abuse and Alcoholism) and private organizations review and use both qualitative and quantitative data to reach conclusions and formulate recommendations affecting the health and well-being of the nation as a whole. CSAP has developed Prevention Enhancement Protocol Systems (PEPS), which convene expert consensus panels to identify what is known about various dimensions of substance use prevention. PEPS panels also examine qualitative data from prevention practice cases in their efforts to assess interventions such as tobacco prevention/cessation and family-oriented prevention.

Data Collection Techniques

Figure 2 identifies the numerous data collection techniques that are used to gain knowledge in the substance abuse field. The techniques are mapped onto a pyramid to provide some idea of the proportion of total information available through particular techniques that have been sufficiently implemented to yield credible findings.

Paradoxically, as indicated in the figure, the more traditionally accepted and more quantitative scientific approaches represent a small proportion of data collection efforts, yet the information derived from such studies constitutes a significant portion of the formal knowledge base. Although the tendency is to ascribe more validity to quantitative efforts, CSAP recognizes that important contributions to the prevention knowledge base are also made by qualitative studies. Independent of how quantitative or qualitative they are, when findings are supported by sound scientific principles, they can be used legitimately and effectively to construct and implement prevention interventions.

Figure 2
Application of Specific Principles and Criteria to Research Findings



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Application of Specific Principles and Criteria to Research Findings

Research studies and the findings they produce vary in credibility. The level of observed credibility of research findings regarding the causes of intervention program effects hinges on whether the methods employed provide at least a reasonable means of assessing change over time attributable only to the program. This simple criterion has a number of components that can be applied to assess the credibility of research. The development of the High Risk Populations (HRP) Databank, a previous CSAP endeavor that critically reviewed the HRP Demonstration Grants, provides an example.

The HRP Findings Bank was an evaluation-oriented information system with a comprehensive, unifying framework. The Findings Bank consisted of three primary components:

- Descriptive information (e.g., location, number and type of sites, target group demographics) about CSAP's high-risk populations grants;
- Compilation of interventions and outcomes produced by the grants; and
- Compilation of interventions and outcomes produced by similar, non-CSAP projects.

The Findings Bank allowed users to relate findings from demonstration programs to outcome measures and to the data that support the findings.

Nine criteria were used by groups of trained, expert evaluators to assess the rigor of grantee program evaluations. Six criteria were used to rate various aspects of methodological rigor (1 through 4, 6, and 7), one was used to rate fidelity (5), one for utility (9), and one for overall integrity and credibility (8).

Viewed in an alternative fashion, criteria 1 through 3 rated the design or planning of the study. They encompassed theoretical bases, sample design, and the outcome measures chosen These three criteria pertained to the planning of both quantitative and qualitative research.

Criteria 4 through 6 related to execution of the study; in other words, how it was implemented. Criterion 5 was a hybrid, addressing both fidelity of program/intervention implementation and the design issue of dosage of program/intervention.

Criteria 7 and 8 took the form of summary evaluations. Criterion 7 captured how well the total design and execution ruled out alternative hypotheses, while criterion 8 reflected overall confidence in results inspired by methodological aspects of study design and execution. Criterion 9 addressed the utility of study results. Considered together, the nine criteria provide one scheme for evaluating all aspects of a quantitative or qualitative intervention.

Program Review Criteria

1. **Theory:** the degree to which findings are grounded in sound theory, reflect clearly stated hypotheses, and are operationally relevant
2. **Sampling strategy and implementation:** the quality of sampling design and implementation and strength of evidence concerning sample quality (e.g., data on attrition)
3. **Measures:** operational relevance, psychometric quality of measures used in the evaluation, and quality of supporting evidence
4. **Data collection:** quality of data collection implementation (e.g., amount of missing data)
5. **Fidelity of interventions:** evidence of high-fidelity implementation of program, as designed, and sufficiency of dosage (e.g., duration, intensity, frequency) to effect positive change
6. **Analysis:** appropriateness and adequacy of statistical techniques used in analysis
7. **Plausible threats to validity:** degree to which evaluation design and implementation address and eliminate reasonable alternative hypotheses about program effects and warrant strong causal attributions
8. **Integrity:** overall level of confidence in project findings based on the research design and implementation
9. **Utility:** strength of findings and strength of evaluation to determine if findings were consistent with respect to expectations or predictions from theory

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Confidence Scale

5 = strong confidence
4 = confident
3 = some confidence
2 = little confidence
1 = no confidence

Application of Criteria

For the review of CSAP's HRP demonstrations, pairs of trained evaluators rated each of the nine criteria on a 5-point scale. Of particular importance was the rating of integrity, on which reviewers were required to come to consensus. This rating reflected how much confidence reviewers had that the intervention alone was responsible for yielding the findings observed. Confidence was derived from the quality of the intervention implementation as well as the design of the evaluation study and how well the evaluation was conducted. For example, when problems in intervention implementation and research design and execution were minimal, reviewers assigned integrity ratings reflecting strong confidence in the findings (i.e., 5).

When a few problems were encountered—for example, attrition was modest, intervention implementation was solid, and analysis was acceptable—an integrity rating of 4 (i.e., confident) was given.

An integrity rating of 3 reflected some confidence in resultant data. This rating was often used when program characteristics were strong enough to inspire some confidence, but because of imperfect implementation of the program, moderate attrition rates, data analyses that were not comprehensive, uncorrected differences between treatment and comparison samples, or secular events that contaminated samples, confidence was not sufficient to assure reviewers that the results were wholly attributable to the program intervention.

If reviewers had little confidence in an experimental study in which there was high and differential attrition, the integrity rating received by such a study was 2—little confidence. If attrition was egregiously pronounced, the study rating may have dropped to 1—no confidence.

Because well-designed studies can be implemented poorly, well-implemented programs can be evaluated poorly, and findings can be overstated, it is important to use criteria capable of exposing these problems. Although overstated findings make no positive contribution to the knowledge

Figure 3
Sample Application of Scientific Criteria to an Intervention
Summary Matrix for Grant ZZZ

	NA	1	2	3	4	5
1. Theory				X		
2. Sampling Strategy and Implementation			X			
3. Measures					X	
4. Data Collection					X	
5. Fidelity of Intervention				X		
6. Analysis			X			
7. Plausible Threats to Validity				X		
8. Integrity				X		
9. Utility				X		

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base, from the perspective of the prevention program designer, policymaker, and funder, negative findings from well-implemented, rigorously evaluated interventions have enormous value because they identify interventions that do not appear to work in naturalistic settings. When objectively reported, they save programs from expending resources in the application of ineffective approaches.

The last rating of utility captured data patterns. Ideally, the field would want to adopt or adapt interventions that yield consistent changes across domains affected by the intervention. For example, program X could demonstrate a dramatic change on a specific targeted behavior such as marijuana use. In response, prevention practitioners in a community where marijuana use was increasing might rush to adopt program X without considering changes across other outcome domains such as skyrocketing underage use of alcohol (drug substitution) or plummeting self-efficacy. Reviewers used the utility rating to gauge the pattern of outcomes and thereby avoid focusing on isolated positive or negative outcomes.

Hypothetical Review Illustrating Application of Criteria

Figure 3 depicts a hypothetical review. In the figure, program ZZZ has an overall rating of 3. The program was rated well on many of the criteria; however, reviewers did not think that program control and treatment groups were comparable prior to the intervention, hence the evaluation of 2 for sampling strategy and implementation. Furthermore, the statistical analyses testing differences between the groups after the intervention did not attempt to control for what might have been meaningful pretest differences. For that reason, analyses received a 2. In addition, the age group differences observed on outcome measures were large and not predicted by theory. However, this intervention, along with a number of others, showed differences in youth's knowledge of the harmful effects of substance use as a result of participating in classroom-based drug education, an outcome that, given the measurement protocols, could not be attributed to any event or occurrence other than the intervention. Therefore, despite mixed confidence, this intervention was considered promising and could be cited as corroborative evidence of the effectiveness of grant ZZZ in altering youth's knowledge about the harmful effects of substance use.

In addition to applying the criteria to the HRP demonstration grants, which include both the High Risk Youth (HRY) programs and programs for Pregnant and Postpartum Women and their Infants, CSAP is using them in a slightly modified form to extract findings from the Community Partnership Program. Likewise, CSAP's National Registry of Effective Prevention Programs (NREPP)—an ongoing repository of scientifically defensible guidance for the substance abuse field—has incorporated the criteria in the 15 dimensions used in its consensus process when assessing the quality of a particular prevention program. These 15 criteria are an expansion of the original nine criteria described on page 6 of this guide. For a full review of these criteria, please refer to the NREPP Web site at www.preventionregistry.org. NREPP has evolved from the HRP Findings Bank and is available to review programs funded from any source, not only from CSAP.

The CSAP Approach To Identifying Scientifically Defensible Prevention Interventions

The CSAP HRP Databank review used a qualitative meta-analytic technique, one of two types of meta-analytic techniques currently favored to organize information and extract defensible principles and practices. In the past, literature reviews were frequently analyzed to determine whether substance abuse prevention programs worked. Meta-analysis offers a major refinement on that approach.

In a literature review, researchers scrutinize and critique original papers, determine the merit of specific items, and then integrate the findings in discussions with each other or alone. Occasionally this thinking results in the proposition of a critical experiment that, if performed, would shed light on the true phenomenon under scrutiny. More often, the result is a simple summary of the field, with the authors' conclusions sup-

ported by the amount and consistency of the data assembled.

Literature reviews make important contributions to understanding the state of the art in the field and help identify gaps in the knowledge base that should be filled. However, because literature reviews are, for the most part, essentially narrative and subjective, use few samples, and lack scientific rigor, they cannot respond adequately to questions about the efficacy of substance abuse prevention programs (Tobler, 1994, p. 343).

Meta-Analysis

To address concerns about program effects, CSAP turned to meta-analysis, a conceptual approach that reviews the results of the full range of primary research, including both published and unpublished, experimental and quasi-experimental studies of programs that succeeded and programs that failed. Meta-analysis uses qualitative as well as quantitative methods to produce aggregated results from multiple programs that can be used to study relationships and test hypotheses (Cook et al., 1992; Light & Pillemer, 1984; Tobler, 1994, p. 357). Because meta-analysis allows researchers to use results from small studies, from studies that are quasi-experimental in design, and from studies with incomplete information in some areas, it offers important advantages when evaluating substance abuse prevention programs (Tobler, 1994, p. 350). In applying meta-analysis, CSAP makes a distinction between the two types. While both forms rely on qualitative judgments as well as quantifying information, they differ in the extent to which they rely on translating initially observed outcomes into hard estimates of effect sizes.

Quantitative meta-analysis systematically codes the results from each study for every variable that may influence program outcomes and converts those results to a standardized score or effect size (Tobler, 1994, p. 345). The end product of the analysis consists of a single best quantified estimate of effect for a specific intervention or the impact of a single contextual factor. Standardization enables meta-analysis to compare programs with different sample sizes, and if effect sizes are consistent and positive, to aggregate them and achieve statistical significance. Because quantitative meta-analytic techniques focus on specific effects, they are extremely useful in identifying consistently moderate or large outcomes, and then in relating these observations to specific program characteristics. Quantitative techniques are also useful in deriving prevention principles and identifying specific prevention interventions that are most closely related to consistently favorable outcomes.

Like any other procedure, meta-analysis is not without potential hazards (e.g., relying solely on journal publications, averaging equally over differentially important measures). Recent quantitative meta-analytic efforts, including Tobler's and Stratton's (1997) analysis of the effectiveness of school-based substance use prevention programs and CSAP's National Center for the Advancement of Prevention meta-analyses of the Correlates of Marijuana Use and the Correlates of Alcohol and Tobacco Use, have advanced the knowledge base considerably.

Qualitative meta-analysis is based on programs as a whole. As an example, in the CSAP HRP Databank review, trained, expert reviewers used standard instruments to evaluate individual programs on the basis of source documents in the form of project final reports, as well as articles published in journals, and come to consensus about their credibility. Inclusion of source materials overcame biases that may have been inherent in using journal articles only.

Qualitative techniques are not limited to main effects models of causation but are robust across interactions and nonlinear models since judgments of effectiveness are based on the integration of implementation, evaluation, and findings within the context of the program. While ratings may be attached to program efforts (e.g., integrity, utility), they are composites weighted by the judgment of expert evaluators and not the product of deconstructed program characteristics averaged across multiple programs or interventions. Systematizing procedures and categorizing outcomes across programs via qualitative meta-analytic technique not only offers decided advantages to traditional literature review efforts, but also ensures that both qualitative and quantitative information is scrutinized so that researchers, policymakers, and program

designers have access to needed outcome and process data.

Distinctions Between Quantitative and Qualitative Techniques

Like quantitative meta-analytic techniques, qualitative procedures use rules for inclusion of information. In general, these rules mirror the nine criteria described previously in reference to the HRP Databank. No matter who conducts the review, research protocols are screened for quality of design and implementation. What may differ is the set of procedures, level of data disaggregation, population of studies eligible for inclusion, and rigor of the review itself.

While both quantitative and qualitative techniques have important roles to play, their purposes are different. The more quantitative techniques are useful in identifying interventions and contextual factors that influence effectiveness, whereas qualitative techniques are most useful in identifying effective programs and models of intervention. As a result, qualitative techniques can be used to identify both successful program models and prevention principles. Both quantitative and qualitative techniques can be supported by field observation and careful review of complete program documentation (e.g., process analyses). Also, both are valuable in developing and deriving principles regarding successful program implementation.

Resources for Identifying Scientifically Defensible Prevention Principles and Programs

CSAP uses both qualitative and quantitative meta-analyses, as well as findings from critical overviews of published research and expert consensus procedures, to identify scientifically defensible prevention principles and programs. Currently, those principles and programs are described in two CSAP publications, *Principles of Substance Abuse Prevention* and *Promising and Proven Substance Abuse Prevention Programs*. Following are descriptions of the specific methods CSAP employed to identify the scientifically defensible principles and programs in both documents.

Qualitative Meta-Analyses

CSAP culled several well-implemented critical reviews to identify credible scientifically defensible principles and programs, including the following CSAP-sponsored efforts:

- Environmental Strategies for Substance Abuse Prevention: Analysis of the Effectiveness of Policies to Reduce Alcohol, Tobacco, and Illicit Drug Problems;
- The Role of Education in Substance Abuse Prevention (Implementation Guide);
- The Role of Information Dissemination and Mass Media in Youth-Oriented Prevention (Implementation Guide);
- The Role of Problem Identification and Referral in Youth-Oriented Prevention (Implementation Guide); and
- A Review of Alternative Activities and Alternative Programs in Youth-Oriented Prevention (CSAP Technical Report 13, 1996).

Expert Panels

In addition to information derived from critical literature reviews, CSAP also incorporated information derived from expert consensus procedures. As part of the consensus process, consensus panel members assessed implementation for fidelity and reviewed research for rigor. Outcomes and reviewer confidence in those outcomes were rated using relatively objective, standard methods. Expert consensus resources included the following:

- National Structured Evaluation (NSE): The NSE was one of the first expert consensus reviews of prevention programs. Using standard procedures and measures, the NSE reviewed and rated the level of methodological rigor of substance use prevention programs implemented through 1991. The NSE effort included federally funded programs as well as programs sponsored by universities, foundations, and state or local governments. When the analysis was complete, 10 percent of the studies reviewed met or exceeded the criteria set for moderately rigorous studies (i.e., a rating of 3).
- William B. Hansen & L. A. Rose (1997): In his work, Dr. Hansen continued to use techniques

employed by the NSE to identify and review substance abuse prevention program evaluations and field studies that reflected effective programming. Data from individual projects were used to derive more general principles concerning program effectiveness.

- National Institute on Drug Abuse (NIDA, 1997): NIDA produced a review document titled *Drug Abuse Prevention for At-Risk Individuals* that cited NIDA-sponsored substance abuse prevention programs viewed as effective and offered general recommendations about key elements of effective interventions.
- Lawrence W. Sherman et al. (1997): Dr. Sherman and colleagues conducted a methodologically rigorous review and rating of U.S. Department of Justice programs modeled after the NSE approach. The authors also evaluated grant and funding mechanisms for adequacy. Principles pertaining to effective strategies were derived and presented as key findings.
- PEPS: Over the past several years, CSAP has sponsored the PEPS, a knowledge development effort that convenes a panel of experts to review the literature in a specific area using a strict evidentiary procedure to evaluate and either include or exclude individual research findings. Findings are then assessed for consistency of valence and magnitude to arrive at a defensible conclusion.
- National Evaluation of the Community Partnership Prevention Grant Program (2000): Extensive cross-site and other evaluations of the CSAP Community Partnership Program have yielded considerable information about communitywide prevention efforts and have identified specific prevention strategies that produce measurable reductions in substance use.
- The CSAP HRP Databank review: This review of the HRP demonstration grants program was designed to identify credible evidence of program effectiveness. An expert consensus process evaluated each final report filed through December 1995 on the criteria defining program credibility. In addition, they rated utility of study information for each program and weighed the consistency of results in determining the evaluation of program effectiveness. Like the NSE, approximately 10 percent of program evaluations met the criteria set for moderate rigor. Of those, an estimated 2 percent of studies reviewed met the more stringent standards that CSAP developed for identifying well-implemented, solidly evaluated, effective model programs.

Quantitative Meta-Analyses

The most stringent coding and rating protocols can be followed when there are a wealth of studies with concordant data. As the discipline of substance abuse prevention continues to evolve, quantitative efforts like these will become more commonplace. CSAP used data from the following quantitative meta-analyses to identify current scientifically defensible principles and programs, as follows:

- Tobler's meta-analyses of school-based prevention programs (1986, 1992).
- Tobler & Stratton, 1997.
- CSAP meta-analysis: CSAP initiated a series of large-scale meta-analyses, each focusing on a specific topic area relevant to substance use and substance use prevention (e.g., Correlates of Marijuana Use Among Youth, Correlates of Alcohol and Tobacco Use Among Youth and Meta-Analysis of the Effectiveness of School-Based Programs).

CSAP accepts data from these qualitative and quantitative sources as credible, relying on the review processes implemented and the expertise of the review panels convened to extract important research findings. With these data as building blocks, it is possible to generalize across agencies and the time periods in which the data were collected to identify replicable model programs and scientifically defensible principles and interventions.

CSAP has developed a series of comprehensive data matrices (Promising and Proven Substance Abuse Prevention Programs) that organizes interventions by risk and protective factors, age, strategy, IOM classification, original program name, and source citation. This inclusive effort includes programs supported by government agencies, including CSAP, National Institute on Drug Abuse (NIDA), National Institute on Alcohol Abuse and

Alcoholism, the U.S. Department of Education, and the U.S. Department of Justice, that have undergone strenuous reviews (such as the CSAP model programs) or have been cited by experts in the field as examples of particular intervention strategies. Interventions entered into the matrix vary in the levels of rigor assigned by reviewers. For example, the CSAP model programs incorporated in the matrix represent the highest level of rigor and credibility. Interventions from other CSAP programs, such as the Community Partnerships, which may have more moderate levels of credibility, are included because careful evaluation attests to their ability to produce positive outcomes. Interventions from other federal agency programs are included because their sponsors have identified them as noteworthy through their own evaluative processes. The matrix is a work in progress that will continue to expand as findings from other promising interventions become available. As the information in the data matrix increases, the interventions cited will provide a broader range of interventions and more specific guidance for selecting those most likely to prove effective with particular populations and in particular domains.

Also available is a second, simpler compilation of scientifically defensible principles called *Principles of Substance Abuse Prevention*. As its name implies, this brief booklet organizes principles and interventions by domain and links them to the prevention strategies identified in the Substance Abuse Prevention and Treatment block grant. Service providers can refer to *Principles* for ideas about what works in substance use prevention, to identify proven interventions in a particular domain, and to justify the use of one or more interventions in a program. Because each principle and intervention is cited, it is relatively easy to locate the full article for more detailed information. Evaluators, grant reviewers, and policymakers may also find it useful as a quick overview of the current state of the art in prevention programming and as a tool useful in ascertaining whether a program is employing scientifically defensible principles and interventions.

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Glossary

Antisocial and other problem behaviors: Can describe behavior-related problems (e.g., poor conduct and impulsiveness), behavior-related disorders (e.g., attention deficit hyperactivity disorder), or both.

Approach: A set of prevention strategies that typifies a program and can be used in an intervention setting without adopting the entire program.

Assignment: The process by which researchers place study subjects in an intervention, control, or comparison group. Experimental design studies randomly assign study subjects to both intervention and control conditions. In quasi-experimental studies, study subjects are nonrandomly assigned to intervention and comparison conditions. Random assignment increases the likelihood that the intervention and control groups are equal or comparable and have similar characteristics.

Attrition: An unplanned reduction in the size of a study sample caused by participants dropping out of the evaluation (e.g., they moved away from the study location).

Behavior-related disorder: A specific behavioral problem that occurs in persistent patterns and characteristic clusters and causes clinically significant impairment.

Behavior-related problem: A behavioral problem that is isolated or intermittent, is not part of a persistent behavior pattern, and varies in severity and seriousness of its consequences.

Community: A group of individuals who share cultural and social experiences within a common geographic or political jurisdiction.

Community-based approach: A prevention approach that focuses on the problems or needs of an entire community, be it a large city, small town, school, worksite, or public place.

Community readiness: The degree of support for or resistance to identifying substance use and abuse as significant social problems in a community. Stages of community readiness for prevention provide an appropriate framework for understanding prevention readiness at the community and state levels.

Community tolerance: Community norms that view problematic behavior as socially acceptable or actively encourage it.

Conduct disorder: A behavior-related disorder that has a repetitive and persistent pattern of violating the basic rights of others or major age-appropriate societal norms or rules. The disorder can include aggression to people and animals, destruction of property, deceitfulness or theft, and serious violation of rules.

Construct: An attribute, usually unobservable (e.g. educational attainment or socioeconomic status), that is represented by an observable measure.

Control group: In experimental evaluation design, a group of participants that is essentially similar to the intervention group but is not exposed to the intervention. Participants are designated to be part of either a control or an intervention group through random assignment.

Credibility of findings: Derives from the quality of intervention implementation plus the methodological rigor of the research. When both are high, findings are attributable to the intervention and therefore have high credibility.

Data: Information collected according to a methodology using specific research methods and instruments.

Data analysis: The process of examining systematically collected information.

Design: An outline or plan of the procedures to be followed in scientific experimentation and research studies to reach valid conclusions.

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Documentation: Entails keeping records, collecting data, and making observations to obtain specific kinds of information, such as the rates of alcohol-related problems, consumption, and sales.

Effect: A result, impact, or outcome. In evaluation research, attributing an effect to a program or intervention requires establishing, through comparison, a logical relationship between conditions with and without the program or intervention.

Effective: The preponderance of research or program findings is consistent, positive, and clearly related to the intervention.

Environmental factors: Those factors that are external or perceived to be external to an individual but that may nonetheless affect his or her behavior. At a narrow level these factors relate to an individual's family setting and relationships. At the broader level, these refer to social norms and expectations as well as policies and their implementation.

Evaluation: The analysis of data obtained through documentation to assess the operation or impact of a policy, program, intervention, or procedure.

Evaluation research: A set of procedures to determine the effectiveness of an intervention program.

Experimental design: A research design involving random selection of study subjects, random assignment of study subjects to control or intervention groups, and measurements of both groups. Measurements are typically conducted before, and always after, the intervention. The results obtained from such studies typically yield the most definitive and defensible evidence of an intervention's effectiveness.

External validity: The extent to which outcomes and findings apply (or can be generalized) to persons, objects, settings, or times other than those that were the subject of the study.

Family: Parents (or persons serving as parents) and children who are related either through biology or through assignment of guardianship, whether formally (by law) or informally, who are actively involved together in family life—sharing a social network, material and emotional resources, and sources of support.

Family in-home support: A prevention approach that addresses risk and protective factors by focusing on preserving families through intervention in their home environments.

Family therapy: A prevention approach that provides professionally led counseling services to a family for the purpose of decreasing maladaptive family functioning and negative behaviors and increasing skills for healthy family interaction.

Fidelity: Agreement (concordance) of a replicated program model or strategy with the specifications of the original.

Framework: A general structure supporting the development of theory.

Generalizability: The extent to which program findings, principles, and models apply to other populations and/or settings.

Impact: The net effect observed within an outcome domain.

Incidence: The number of new cases of a disease or occurrences of an event in a particular time period, usually expressed as a rate, with the number of cases as the numerator and the population at risk as the denominator. Incidence rates are often presented in standard terms, such as the number of new cases per 100,000 population.

Indicated prevention measure: A preventive measure directed to specific individuals with known, identified risk factors.

Individual-centered approach: A prevention approach that focuses on the problems and needs of the individual.

Initiation: The stage at which a prevention program is underway but still on trial. Community members often have great enthusiasm for the effort at this stage because it has not yet encountered obstacles.

Instrument: A device researchers use to collect data in an organized fashion, such as a standardized survey or interview protocol.

Integrity: The level of credibility of study findings based on peer consensus ratings of quality of implementation and evaluation methods.

Intended measurable outcome: The overall expected consequences and results of the interventions within each prevention approach.

Intervention: An activity or set of activities to which a group is exposed in order to change the group's behavior. In substance abuse prevention, interventions may be used to prevent or lower the rate of substance abuse or substance abuse-related problems.

Methodology: A procedure for collecting data.

Multicomponent program: A prevention program that simultaneously uses multiple interventions that target one or more substance abuse problems. Programs that involve coordinated multiple interventions are likely to be more effective in achieving the desired goals than single-component programs and programs that involve multiple but uncoordinated interventions.

Nonexperimental design: A type of research design that does not include random assignment or a control group. In nonexperimental research designs, the attribution of an observed effect to the intervention is compromised.

Outcome: Changes observed on targeted measures.

Outcome evaluation: An analysis that focuses research questions on assessing the effects of interventions on intended outcomes.

Parent and family skills training: A prevention approach in which parents are trained to develop new parenting skills and children are trained to develop prosocial skills.

Pretests and posttests: In research designs, the collection of measurements before and after an intervention to assess its effects.

Prevalence: The number of all new and old cases of a disease or occurrences of an event during a particular time period, usually expressed as a rate, with the number of cases or events as the numerator and the population at risk as the denominator. Prevalence rates are often presented in standard terms, such as the number of cases per 100,000 population.

Prevention principle: A principle is prescriptive and can provide implementation directions and define effective practices. A principle can be derived from science-based program evaluations, either across multiple program implementations of the same type or of programs of different types through meta-analyses.

Program: The sum of all program modules implemented by an administrating agent.

Program activity: A specified set of behaviors that constitutes a portion of an intervention strategy (e.g., lecture, field trip).

Program component: The module or component is one of several parts that are grouped together to form a complete program.

Program evaluation: The application of scientific research methods to assess a program's concepts, implementation, and effectiveness.

Program model: A program taken as a whole. The model comprises the program activities and interventions and the administrative structure.

Program module: An intervention activity affecting a target population.

Protective factor: An influence that inhibits, reduces, or buffers the probability of drug use or abuse, or a transition to a higher level of involvement with drugs.

Qualitative data: In evaluation studies, contextual information that usually describes participants and interventions. These data are often presented as text. The strength of qualitative data is their capability to illuminate evaluation findings derived from quantitative methods.

Quantitative data: In evaluation studies, measures that capture changes in targeted outcomes (e.g., substance abuse) and intervening variables (e.g., attitudes toward substance abuse). The strength of quantitative data is their use in testing hypotheses and determining the strength and direction of effects.

Quasi-experimental design: A research design that includes intervention and comparison groups and measurements of both groups, but in which assignments to the intervention or comparison groups are not done randomly. In such research designs, attribution of an observed effect to the intervention is less certain than in experimental designs.

Random assignment: The process through which members of a pool of eligible study participants are assigned to either an intervention group or a control group on a random basis, such as through the use of a table of random numbers.

Reliability: The extent to which a measure produces the same result time after time, across venues and raters.

Representative sample: A segment of a larger body or population that mirrors in composition the characteristics of the larger body or population.

Research: The systematic effort to discover or confirm facts by scientific methods of observation and experimentation.

Resilience: Either the capacity to recover from traumatically adverse life events (e.g., the death of a parent, divorce, sexual abuse, homelessness, or a catastrophic event) and other types of adversity so as to achieve eventual restoration or improvement of competent functioning or the capability to withstand chronic stress (e.g., extreme poverty, alcoholic parents, chronic illness, or ongoing domestic or neighborhood violence) and to sustain competent functioning despite ongoing stressful and adverse life conditions.

Risk factor: A condition that increases the likelihood of substance abuse.

Sample: A segment of a larger body or population.

Science-based: Substantiated through an expert consensus process. Conceptual and exact replications add to the credibility of findings, principles and models as being effective. (See operational definition in text for further elaboration.)

Selective prevention measure: A preventive measure directed to subgroups of populations that have higher-than-average risk for developing a problem or a disorder.

Simple random sample: In experimental research design, a sample derived by indiscriminate selection from a pool of eligible participants, such that each member of the population has an equal chance of being selected for the sample.

Single-component program: A prevention strategy using a single intervention to target one or more problems.

Sociodemographic factors: Social trends, influences, or population characteristics that affect substance abuse-related risks, attitudes, or behaviors. Such factors can have an indirect but powerful influence.

Social development model: A model that seeks to explain behaviors, which are themselves risk factors for substance abuse, by specifying the socialization processes (the interaction of developmental mechanisms carried out through relationships with family, school, and peers) that predict such behavior.

Social ecology model: A model that posits that an adolescent's interactions with social, school, and family environments ultimately influence substance abuse and other antisocial behaviors. The model also emphasizes the importance of increasing opportunities within the social environment for youth to develop social competencies and self-efficacy.

Statistical significance: The strength of a particular relationship between variables. A relationship is said to be statistically significant when it occurs so frequently in the data that the relationship's existence is probably not attributable to chance.

Strategy: An individual component of a program intervention (e.g., life skills training or mentoring). CSAP promulgates six specific strategies. These strategies are information dissemination, prevention education, alternatives, problem identification and referral, community-based process, and environmental strategies.

Substance abuse: Refers to the consumption of psychoactive drugs in such a way as to significantly impair an individual's functioning in terms of physical, psychological, or emotional health; interpersonal interactions; or functioning in work, school, or social settings. The use of psychoactive drugs by minors is considered substance abuse.

Universal preventive measure: A preventive measure directed to a general population or a general subsection of the population not yet identified on the basis of risk factors, but for whom prevention activity could reduce the likelihood of problems developing.

Utility: Usefulness. Any science-based finding or principle has utility if it can be used to guide program development or implementation.

Validity: The extent to which a measure of a particular construct truly reflects that construct.

Variable: A factor or characteristic of an intervention, participant, or context that may influence or be related to the possibility of achieving intermediate or long-term outcomes.

NOTE: This glossary is based in part on work performed by Birch & Davis Associates, Silver Spring, Md.; Westover Consultants, Silver Spring, Md.; the Pacific Institute for Research and Evaluation, Bethesda, Md.; The CDM Group, Chevy Chase, Md. (under contract to CSAP); and Paul Brounstein, Ph.D., and Stephen Gardner, D.S.W., CSAP.

*U.S. Government Printing Office: 2002 — 716-983/96265

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DHHS Publication No. (SMA)01-3505
Printed 2001

CSAP Center for Substance Abuse Prevention
Substance Abuse and Mental Health Services Administration

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